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NOTES AND LITERATURE.

GENERAL BIOLOGY.

Driesch's *Naturbegriffe und Naturteile*.¹— This introduction to the author's philosophy of nature in a sense completes his systematic empirical and theoretical treatment of biology, for the present volume is, as he remarks, on the one hand the conclusion of his theoretical biological work and on the other the presentation of the results of investigations which transcend biology and even natural science itself.

In his earlier books : *Die Lokalisation morphogenetischer Vorgänge*, *Analytische Theorie der organischen Entwicklung*, *Die organischen Regulationen*, *Die "Seele" als elementarer Naturfaktor*, Driesch has discussed with insight the chief facts and principles of morphogenesis, even to the development of mind, in their relations and their theoretical bearings. He now attempts a philosophy of nature, but he has not used the title *Naturphilosophie* because he feared that the word philosophy might prevent the reading of the book by those for whom it was written! Certainly he has ground for his suspicion that most biologists have little interest in the concepts of reality, constant, energy, measure, substance, entelechy which are analyzed in the book.

The morphology of certain concepts which are of fundamental importance in biology as well as in other natural sciences is a brief characterization of *Naturbegriffe und Naturteile*. Those who care to know what a philosophically inclined biologist thinks concerning the structure and functions of the basal concepts of his science will be interested in Driesch's work.

R. M. Y.

De Vries' *Species and Varieties*.²— The widespread interest which has been aroused by the discoveries of Professor de Vries makes the publication of this book an important and welcome event.

¹ Driesch, Hans. *Naturbegriffe und Naturteile. Analytische Untersuchungen zur reinen und empirischen Naturwissenschaft.* Leipzig, Englemann, 1904. 8vo, viii + 239 pp.

² de Vries, Hugo. *Species and Varieties, their Origin by Mutation*, edited by D. T. MacDougal. Open Court Pub. Co., Chicago, 1905. 8vo, xviii + 847 pp.

It is a matter of congratulation that we should now have, in English, a discussion of the mutation theory and the line of thought which led the author to put it forward, as well as an account of the experiments on Lamarck's Evening Primrose which has figured so largely in the habilitation of the theory. Not indeed that this volume is to be regarded as a translation of his *Mutations-theorie*, for without the great amount of detail found in that work it treats the subject in a broader way, aiming to bring out the mutation concept with sufficient specific illustration to support the principles enunciated. After the introductory chapter, which is of a historical nature, the discussion of what are termed elementary species affords the topic of several of the succeeding ones. Here we find a highly illuminating treatment, which, in connection with what is said later about varieties, serves to give a clarified conception of the import of the Linnean group or collective species. That the latter are, indeed, an abstract idea, an average as it were of a number of types grouped together, is brought sharply to the attention. The modern taxonomist who is in sympathy with this idea must at once see a new significance to the segregations which are constantly and often of necessity being made from the older forms which have been considered species. Elementary species are contrasted with varieties, in that they differ in more than one respect and possess qualities which are distinctly new, while in varieties the whole character difference may usually be expressed by a single term and which, as the evidence goes to show, do not possess any really new qualities. Most varieties arise in a negative way, by the loss of some quality, and much more rarely do they appear to be positive, possessing some feature new to themselves, which, however, is to be regarded as the reappearance of a character seen in allied forms. Moreover, these characters are, whether of a positive or of a negative nature, physiologic units and appear and disappear singly. From this the development of the author's line of thought leads him to the consideration of atavism and the associated subject of hybridism. In discussing true atavism all cases which might be confused with it that arise from hybridism, or from varieties which annually produce sports, are to be excluded. Atavistic tendencies in this strict sense are found to be very rare, and while reversionary forms may often be widespread in the sense of geographical distribution, it is found that this is due to bud propagation. For what the author calls false atavism he introduces a new term,—vicinism,—to carry the idea of chance spatial contiguity, which results in spontaneous and often undetected crosses. Under this head then will come many of the instances of so called atavism.

Continuing the subject of hybridism we find again a difference between elementary species and varieties in the way in which they behave when crossed. In crossing varieties all the characters are paired, though some may be latent, and the progeny follow the Mendelian law of splitting. Such crosses may be termed bisexual to contrast them with the unisexual crosses of elementary species. The latter species differing in one or more unit characters, which are not paired as in the first case, the result is a hybrid offspring which is constant.

Having brought out the differences of elementary species and varieties along the lines indicated, the author next inquires into the question of the origin of new forms and here again shows that the behavior of the two are unlike and that "sports" originating from varieties do not introduce anything really new. To treat this last-named topic the author has been constrained to coin a new term to designate varieties which produce "sports" in each generation and these he has called "eversporting varieties." The wide range of variability seen in such forms is due to the presence of mutually excluding characters, by reason of which the forms swing from one extreme to the other. In most cases, however, latency of the more or less absent character not being complete, there are intergrading forms found. Thus such sports are not in reality new forms. The appetite of the reader having been whetted by this as it were introductory matter, the discussion of the origin of new forms in the production of elementary species, that is mutation, is attacked with the greater zest. Here indeed is the climax of the book, for which the reader has been carefully prepared by what has gone before.

The subject is introduced by an account of the peloric toadflax and the origin of double flowers, but of course the major interest lies in the description of Professor de Vries' minutely careful pedigree cultures of *Oenothera lamarckiana*, Lamarck's Evening Primrose. It is not necessary here to recount the manner in which the author came to experiment on this plant, or the manner in which the experiments were carried on. In this country we are already familiar with much of this from work done here, which looks to corroboration and extension of Professor de Vries' all-important observations. It is sufficient to say that from this plant, under closely guarded conditions of culture, several markedly distinct forms or mutants were seen to arise and that these mutants have through successive generations bred true to their newly originated characters. Several principles or laws regarding mutation are deduced as follows. New

elementary species appear suddenly, without intermediate steps. New forms spring laterally from the main stem. New elementary species attain their full constancy at once. Some new strains are evidently elementary species, while others are to be considered as varieties. The same new species are produced in a large number of individuals. The mutations take place in nearly all directions.

The great difference between this and the Darwinian theory of the origin of species is that here we have new forms which are to be recognized as specifically distinct, arising in perfectly constant form, by sudden leaps, or more properly mutations, rather than by continuous slow variations. This and the fact that many individuals, whole species indeed, are mutating simultaneously, must profoundly modify the Darwinian concept. It is superfluous here to enter further into this discussion or to point out how in other ways our ideas must be rearranged to be consonant with these new facts. That the question is completely solved no one, probably the author least of all, would be prepared to admit, but that much light has been thrown on the matter can hardly be questioned. It has been said somewhere that while Professor de Vries has given us a Mutation Theory he has not given us a Theory of Mutation. That may indeed be true, but let us at least be thankful that here we have this question of the origin of species at last within the field of experimentation. Perhaps it will be possible for us to determine later what are the predisposing conditions or influences which make for mutation, whether or not there is any definite periodicity to the phenomenon. Not least important, too, is the bringing of the whole matter within the scope of physiological inquiry, and the insistence that morphological tests unconfirmed by physiological ones are only provisional. There is bound, of course, to be considerable misconception as to what really are and what are not mutations, and the intuitive plant-breeder will no doubt be tempted to lay too great confidence on the scientific value of his own experiments, yet in this way too the book, if understandingly read, will prove of the greatest value. It cannot be too often stated that the confidence one has in the results of Professor de Vries is that his were pedigree cultures guarded from contamination with the greatest care and with the complete ancestry of his plants minutely recorded from the time he undertook the work. There can, indeed, be no excuse for any scientific investigator proceeding along these lines of research in a loose or careless way after a perusal of this volume, yet it ought to, and no doubt will, stimulate many with the desire to, themselves, add something to the sum of

knowledge in these matters. The book, while necessarily somewhat technical at times, is by no means beyond the comprehension of the general reader, who knows even a little about plants.

H. M. R.

ZOÖLOGY.

Sedgwick's Text-book of Zoölogy.¹—The second volume of Sedgwick's *Text-book of Zoölogy* is devoted to amphioxus and the vertebrates. The volume, which contains over 700 pages, may be described as a revised expansion of the vertebrate portion of Claus and Sedgwick. The expansion has been in part due to the addition of materials on fossil vertebrates which were very inadequately dealt with in the older text-book. The chapter on the Cephalochorda deals almost exclusively with *Amphioxus lanceolatus*, the structure and development of which is most admirably portrayed. Here, however, the description ends, for almost nothing of value is given concerning the natural history, distribution, or taxonomy of this important and interesting group of animals. In fact we are told that the phylum contains only a single genus, *Amphioxus*, a statement so conservative as to be misleading. The remaining chapters treat of the vertebrates proper and contain as a rule well balanced descriptions of the larger and smaller groups of this phylum reminding one of the treatment accorded them in Claus's classic text-book except that Sedgwick gives us an adequate account of the fossil representatives. In fact the striking feature of this new text is the complete absorption of paleontology into the body of zoölogy, a logical and natural consequence of the growth of these two sciences. In another respect, however, the new volume is strikingly out of touch with recent work; it is almost without reference to animal physiology. Although the recent results of comparative physiology are by no means as ripe for incorporation into a general zoölogical text as those of paleontology, they are certainly far too important to be omitted from such a work as Sedgwick's and they are assuredly as truly a

¹Sedgwick, A. *A Student's Text-book of Zoölogy. Vol. II.* London, Swan, Sonnenschein and Co., 1905. 8vo, xvi + 705 pp., 333 figs.